

# Device Modeling Report

COMPONENTS : VOLTAGE COMPARATOR  
PART NUMBER : LM319M  
MANUFACTURER : NATIONAL



**Bee Technologies Inc.**

## BJT MODEL

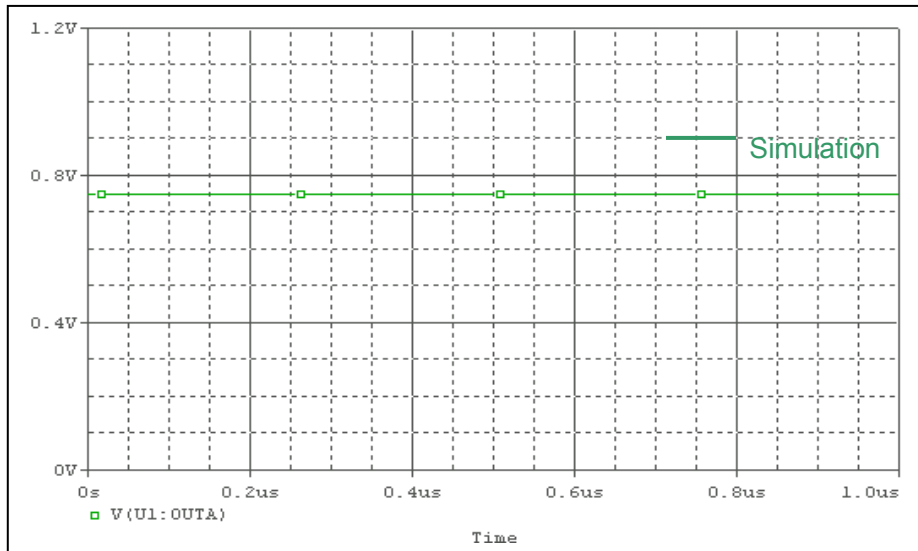
| Pspice model parameter | Model description                             |
|------------------------|-----------------------------------------------|
| IS                     | Saturation Current                            |
| BF                     | Ideal Maximum Forward Beta                    |
| CJC                    | Zero-bias Collector-Base Junction Capacitance |
| TF                     | Forward Transit Time                          |
| TR                     | Reverse Transit Time                          |

## DIODE MODEL

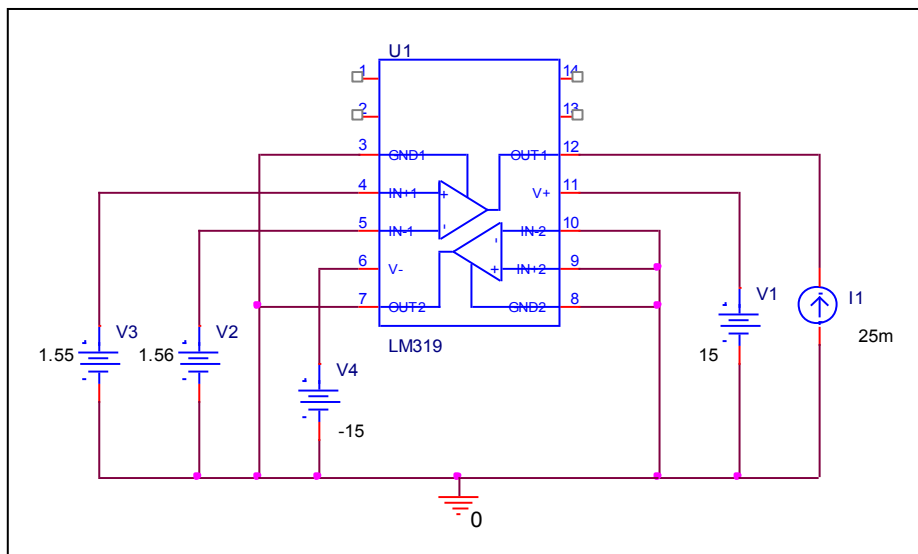
| Pspice model parameter | Model description  |
|------------------------|--------------------|
| IS                     | Saturation Current |
| RS                     | Series Resistance  |

## Output Low Voltage

### Simulation result



### Evaluation Circuit

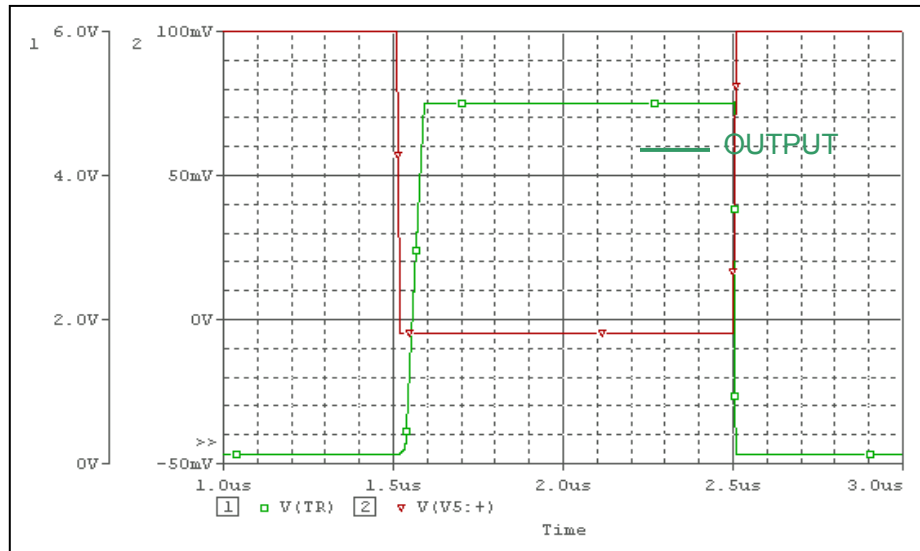


### Comparison Table

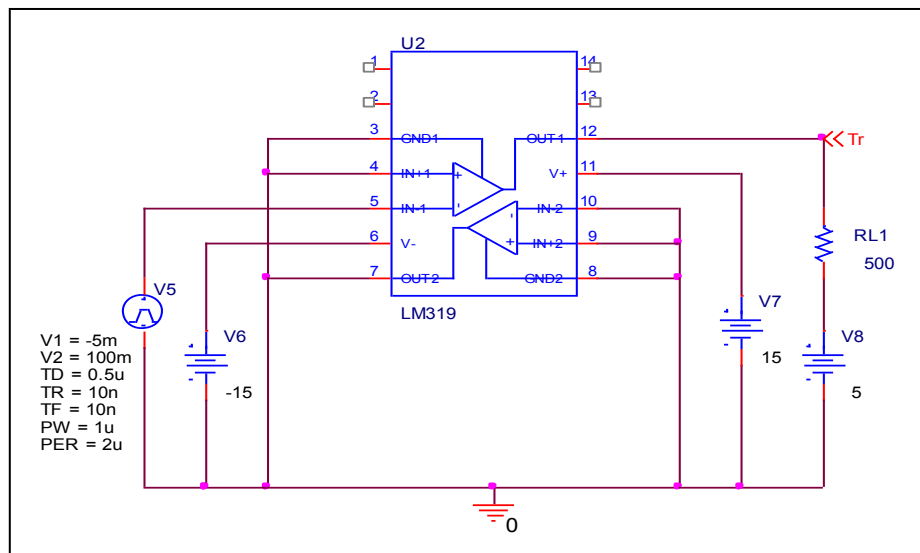
| $I_O = 25\text{mA}$  | Measurement | Simulation | %Error |
|----------------------|-------------|------------|--------|
| $V_{ol} \text{ (V)}$ | 0.75        | 0.750451   | 0.06   |

## Response time (Rise time and Transition time)

### Simulation result



### Evaluation Circuit

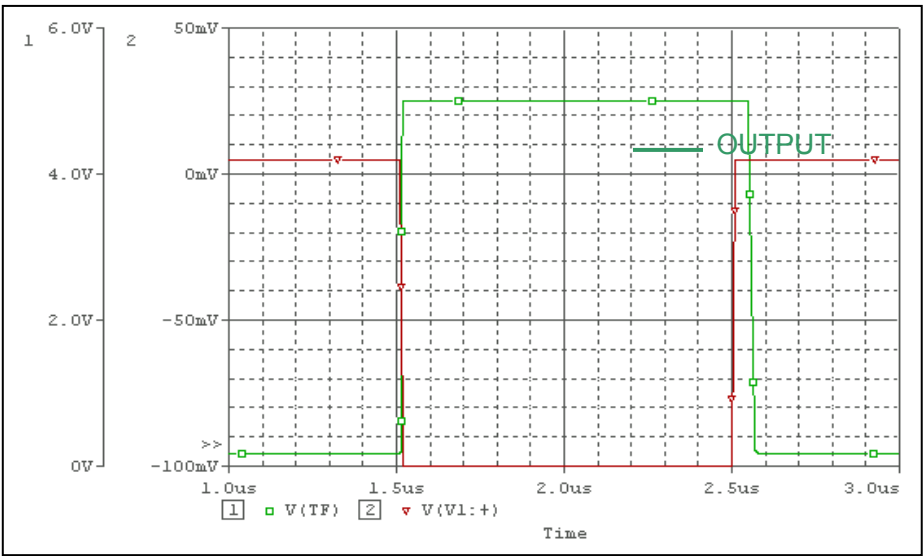


### Comparison Table

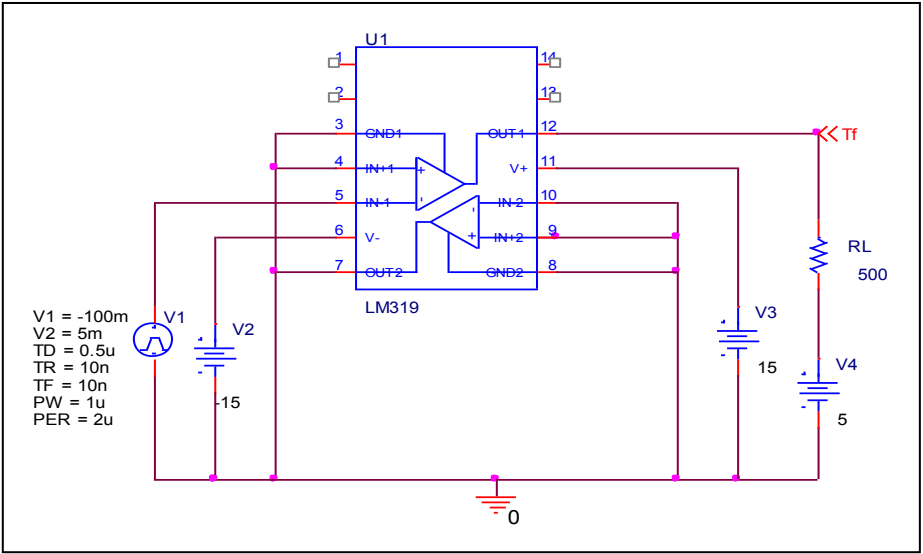
|                               | Measurement | Simulation | % Error |
|-------------------------------|-------------|------------|---------|
| <b>Rising delay time (ns)</b> | 30          | 29.718     | -0.940  |
| <b>Transition time (ns)</b>   | 45          | 44.305     | -1.544  |

# Response time (Falling time)

## Simulation result



## Evaluation Circuit

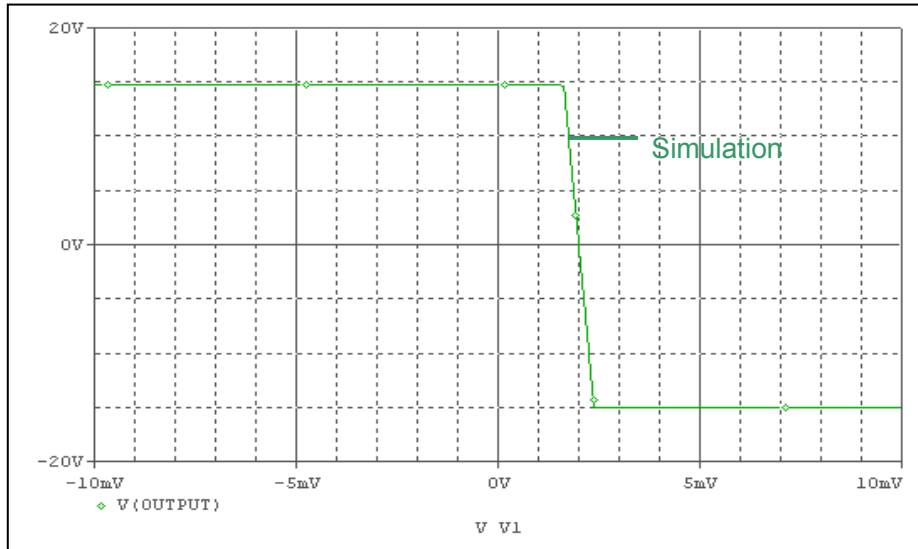


## Comparison Table

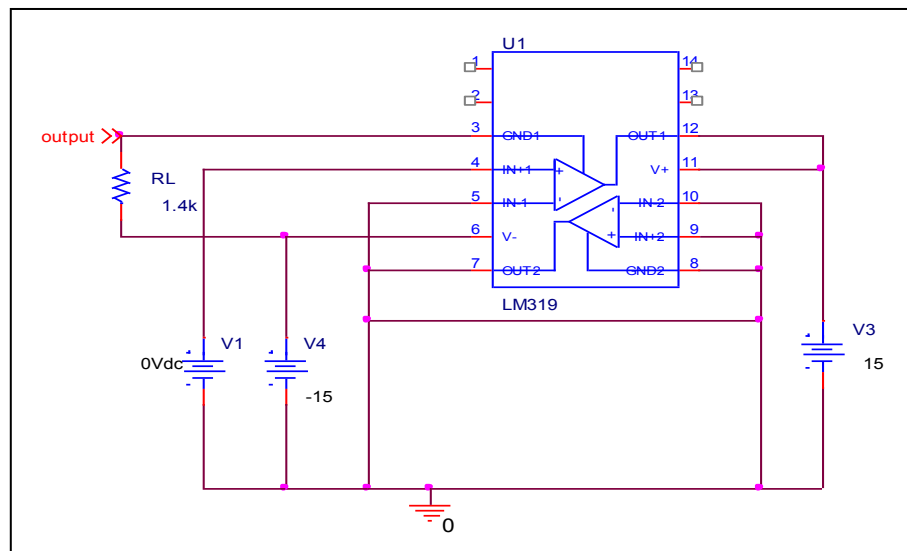
|                         | Measurement | Simulation | % Error |
|-------------------------|-------------|------------|---------|
| Falling delay time (ns) | 50          | 49.947     | -0.106  |

## Input Offset Voltage Characteristics

### Simulation result



### Evaluation Circuit

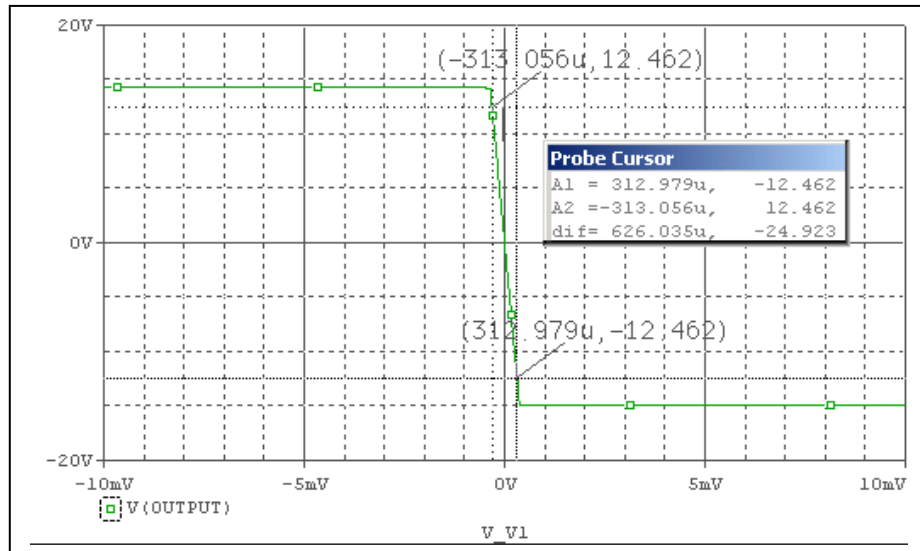


### Comparison Table

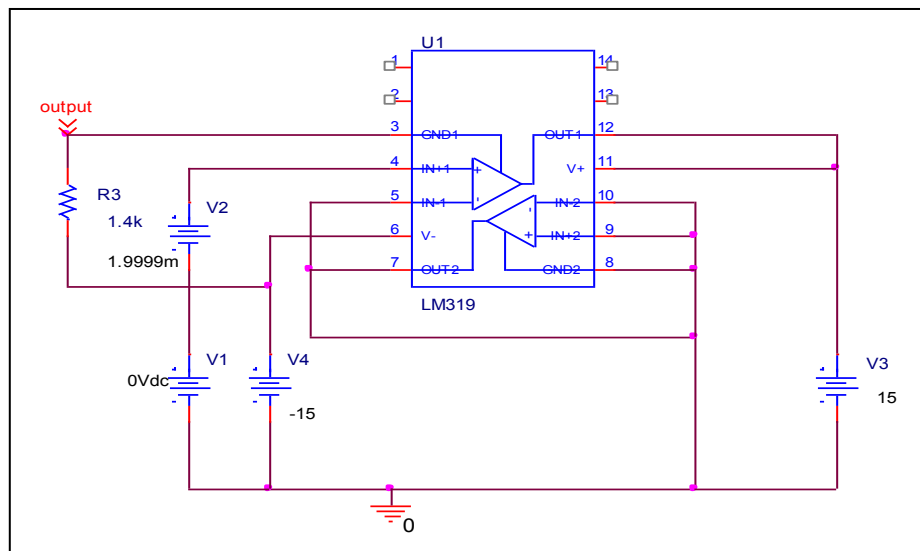
|              | Measurement | Simulation | %Error |
|--------------|-------------|------------|--------|
| $V_{io}(mV)$ | 2           | 1.9999     | -0.005 |

## Av Characteristics

### Simulation result



### Evaluation Circuit



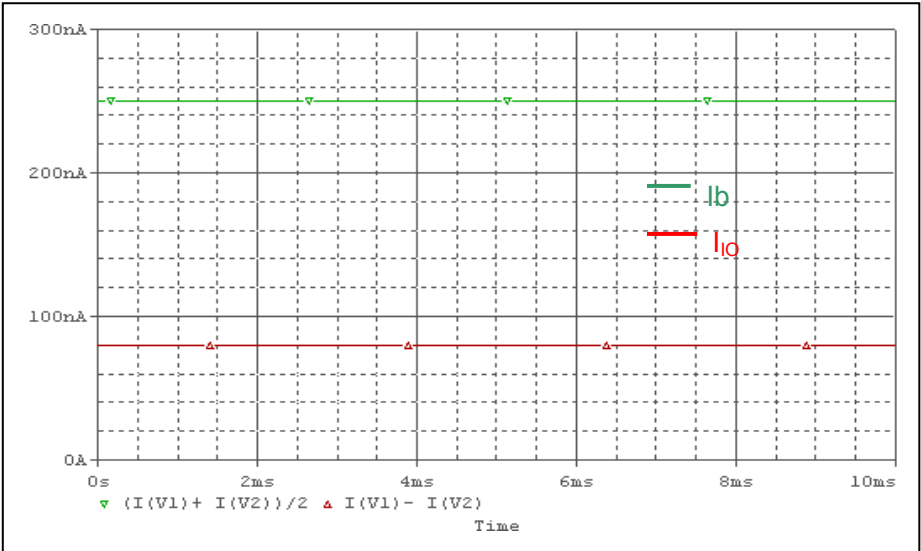
$$A_v = 24.923 / 626.035u$$

### Comparison Table

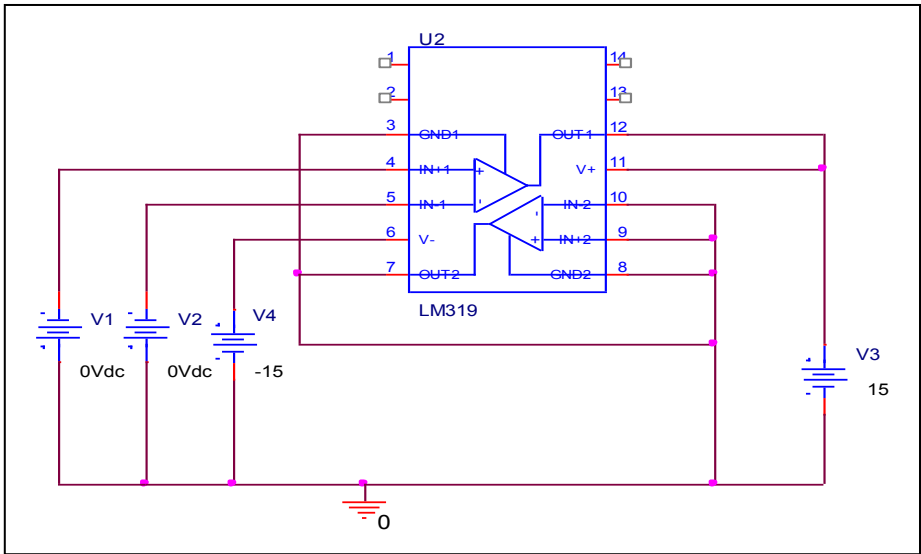
|              | Measurement | Simulation | %Error |
|--------------|-------------|------------|--------|
| $A_v$ (V/mV) | 40          | 39.810     | -0.475 |

# Input Bias Current Characteristics

## Simulation result



## Evaluation Circuit



## Comparison Table

|                      | Measurement | Simulation | % Error |
|----------------------|-------------|------------|---------|
| I <sub>b</sub> (nA)  | 250         | 250.020    | 0.008   |
| I <sub>io</sub> (nA) | 80          | 79.988     | -0.015  |